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**Abrasive member**

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(73) Proprietor  
**Interface Developments  
Limited,  
Ockham Works  
Dagg Lane  
Ewhurst Green  
Robertsbridge  
East Sussex TN32 5RD**

(72) Inventor  
**Michael Moore**

(74) Agent and/or  
Address for Service  
**Walford & Hardman Brown,  
Trinity House  
Hales Street  
Coventry CV1 1NP**

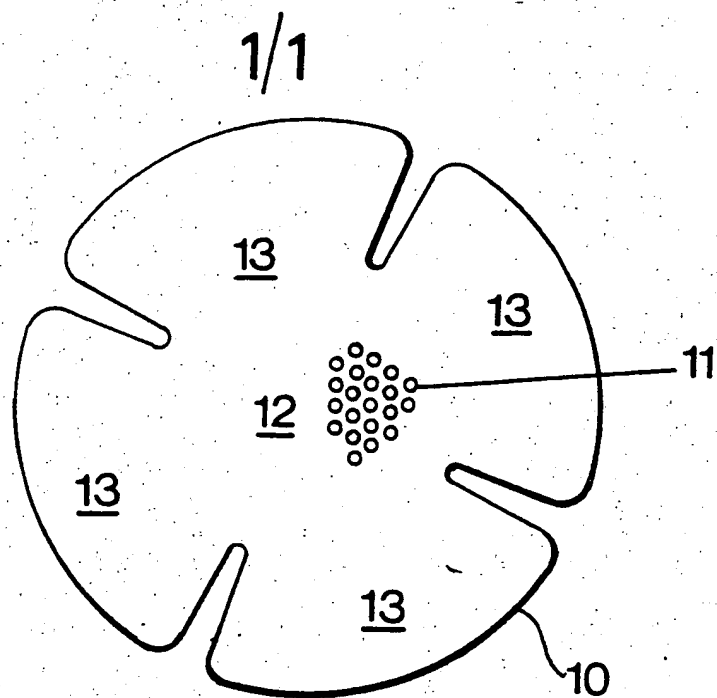


FIG.1

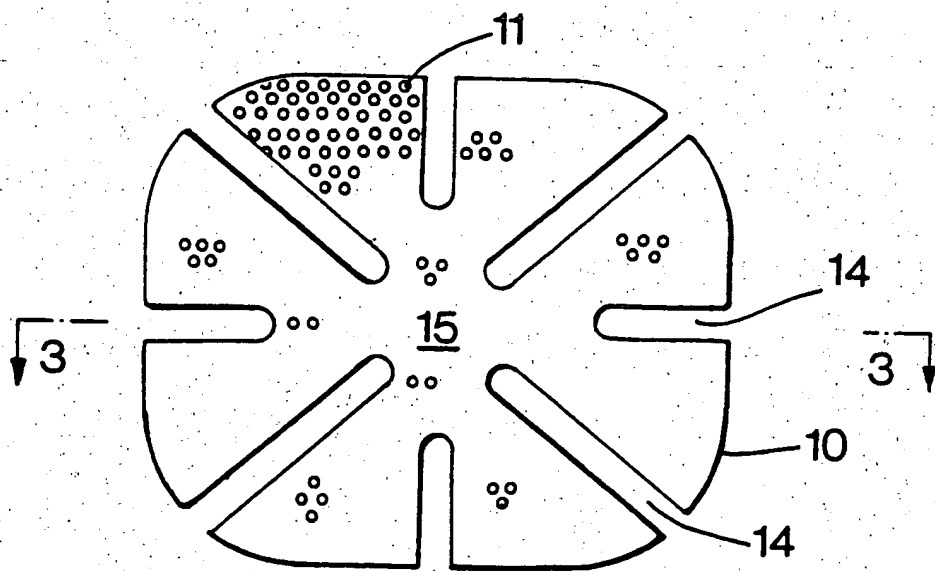


FIG.2

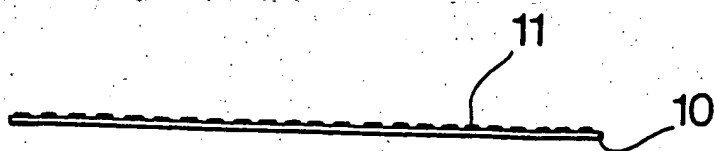


FIG.3

ABRASIVE MEMBER

This invention relates to abrasive members and to a method of making abrasive members.

5 In our prior European Patent Application 79302792.1 (publication No. 0013486) we have described a flexible abrasive member particularly suitable for grinding, smoothing and performing other operations on glass or other materials and a method of making the member. The member finds particular application in grinding lenses. This prior method includes applying discrete areas of metal in which abrasive particles are embedded to a flexible backing material in the form of mesh by means of an electro-deposition process. The members thus formed have been found to be highly effective in removing glass from lenses and they can be used both for removing a thickness of glass from lenses and for applying a smooth surface finish to the lenses. However it is usually required that two abrasive members need to be used, one containing a coarser grade of abrasive for providing a rough finished lens and the other containing a finer grade of abrasive for final finishing of the lens. It is desirable that a single abrasive member be used for removing a layer of the material of the lens and for applying a smooth finish prior to polishing.

25 Other methods of providing abrasive members have also been proposed. For example metal plates incorporating abrasive have been formed by powder metallurgy but such plates can not be formed in thin sections and are not flexible.

30 Apart from our prior method referred to above, other

methods have employed electro-deposition of metal with embedded abrasiv , such as disclos d in British Patent Specifications 1,375,571 and 1,458,236. The abrasive members r sulting from thes methods are flexible but  
5 have been found to be quite unsuitable for lens grinding.

There has also been proposed abrasive members comprising resin material incorporating abrasive but no way has hitherto been found of providing a resin based member which has the flexibility and resilience required.  
10 However a resin-bonded abrasive sheet appears to provide a more flexible seating for the individual abrasive particles compared with metal-bonded abrasive members.

An object of the invention is to provide an abrasive member and a method of making it by which an abrasive  
15 member is provided which is capable of removing a layer of material and of providing a smooth surface finish in one operation.

According to one aspect of the invention in a method of making an abrasive member a flowable intimate mixture  
20 of resin and abrasive is formed, the resin/abrasive mixture is applied through masking means directly onto a flexible backing member of woven or perforated material, the masking means having a plurality of openings corresponding to discrete areas of the backing member to  
25 which the mixture is to be applied, the mixture is cured to harden the resin and to cause the resin to adhere to the surface of the backing material thereby to define discrete abrasive areas on the backing material.

Preferably the backing material presents a surface  
30 over which the mixture is applied so that said discrete abrasive areas stand proud of said surface.

The backing material can be of any convenient <sup>woven or perforated</sup> form which provides the necessary flexibility and strength. For example woven material such as woven nylon, polyester, or cotton material can be used. Alternatively  
5 perforated flexible paper, metal, plastics (e.g. polythene), or rubber, in sheet form can be used.

The application of the resin/abrasive mixture is by any convenient means incorporating masking means, such as by silk screening, stencil, wire mesh, in which discrete  
10 areas of the backing sheet can be applied with the resin/abrasive mixture in the desired pattern. The discrete areas are conveniently regularly spaced over one side of the backing member.

The pattern of the discrete areas applied with the  
15 resin/abrasive mixture varies according to the use to which the member is to be put. Thus the areas can be equal or unequal in size and they may be large or small.

For example the areas can range in size from the size of a small dot to an area several inches across. The  
20 spacing between the areas can similarly be varied from closely spaced to widely spaced areas. When used to effect a high surface finish on small sized sensitive materials, such as small ceramic insulators and thin glass sections, the areas of resin/adhesive may be small  
25 and closely spaced. When used to effect smoothing of larger surfaces such as slabs of marble or other stone the areas of resin adhesive may be considerably larger and more widely spaced to allow the passage of coolant and waste materials.

30 The nature of the abrasive material used depends on the application of the finished abrasive member. Suitable materials include natural and synthetic diamond,

synthetic Borozon, silicon carbide, zinc oxide, aluminium oxide, cerium oxide, alone or in combination. The size of the abrasive may be from 1 micron up to 1 mm dependent on the application of the member.

5 A wide range of proprietary resins are suitable for use with the method of the invention and in curing the resin the curing conditions will be dependent on the resin used. In general a higher curing temperature results in a lower curing and hardening period.

10 Suitable resins include epoxy resins such as those sold by Coates Special Products Limited under the designations XZ06, XZ 09, XZ 12, XZ15-17, XZ-39 and XZ40, and those resins sold by Ciba-Geigy under the designations 2001, 2002, 2004-6 and AV 121, AV 123B,  
15 AV 129, AV 133, HV 133 and AV 138.

Conveniently the resin/abrasive mixture is in liquid, semi-liquid or paste form when applied to the backing member.

20 According to a second aspect of the invention an abrasive member made according to the method of the invention comprises a flexible woven or perforated backing material to which is directly adhered discrete areas of an intimate mixture of cured resin/abrasive.

25 The method of the invention may result in a length of backing material on which a pattern of discrete areas of cured resin/abrasive is formed in which case the length may be cut to the desired shape of individual abrasive members. Alternatively the backing material may be cut to the desired shape before the resin/  
30 abrasive mixture is applied.

The shapes of the individual abrasive members may take many forms dependent on the intended use of the member.

For example if the members are to be used on marble or granite they may be circular and up to 50 cms in diameter and they may have waterways for flushing away ground-off material. The members may be formed in strips for orbital sanding machines or in endless lengths for other sanding machines. When used for finishing moulds the members may be dome- or cup-shaped.

5 The abrasive member may, in some cases, be applied to  
a rigid base member by adhering the backing material,  
with the side bearing the areas of resin/abrasive  
uppermost to the base member. The base member may be  
a flat or curved metal block, the shape being dependent  
on the application of the member. Although the base  
member is in this case rigid the resilient backing  
material enables the individual areas of resin/abrasive  
to be resiliently located and able to absorb shock  
loadings in use.

10 When used for grinding opthalmic lenses the abrasive  
members may be in one of the forms shown in the  
accompanying drawings in which:

Fig. 1 is a plan view of one embodiment,

15 Fig. 2 is a plan view of another embodiment, and

Fig. 3 is a cross section on line 3-3 in Fig. 2.

Referring to the drawings a flexible backing sheet 10  
is applied all over one of its surfaces with discrete  
circular areas 11 of cured resin abrasive material.

20 In the case of the Fig. 1 embodiment the sheet 10 is of  
generally circular shape having a central portion 12  
from which extends part-segmental portions 13, each of  
which has a regular pattern of the abrasive areas 11  
standing proud of the backing sheet 10.

25 In the Fig. 2 embodiment the sheet 10 is generally  
square with rounded corners and slots 14 are formed  
extending inwards from the corners and the side edges  
towards a central portion 15.



In each case the areas of resin and abrasive are spaced apart in such a manner that the flexible backing material between the areas can flex freely without the areas cracking and the resulting member is freely flexible to conform to the article being ground and/or polished.

The abrasive members of the invention have been found to be simple to make and they give the facility for removing layers of material from the article to be ground and at the same time to give a finely smoothed finish. In addition it has been found possible to incorporate into the resin fine abrasive particles of the smallest sizes which hitherto have been difficult to use in electroplated and other abrasive members. The fixing of the resin/abrasive areas to flexible, resilient backing material gives the abrasive material the ability to absorb shock loadings. The use of resin gives a seating for the abrasive particles which is relatively flexible and enables a smooth finish to be achieved.

Claims

1. A method of making an abrasive member wherein a flowable intimate mixture of resin and abrasive is formed, the resin/abrasive mixture is applied through masking means directly onto a flexible backing member of woven or perforated material, the masking means having a plurality of openings corresponding to discrete areas of the backing member to which the mixture is to be applied, the mixture is cured to harden the resin and to cause the resin to adhere to the surface of the backing material thereby to define discrete abrasive areas on the backing material.
2. A method according to claim 1 wherein the backing material presents a surface over which the mixture is applied so that said discrete abrasive areas stand proud of said surface.
3. A method according to claim 1 or 2 wherein the flexible backing member is selected from woven nylon, polyester and cotton material.
4. A method according to claim 1 or 2 wherein the flexible backing member is in sheet form and is selected from perforated flexible paper, metal, plastics and rubber.
5. A method according to any one of the preceding claims wherein the masking means is in a form selected from silk screen means, stencil means, wire mesh means.
6. A method according to any one of the preceding

claims wherein said discrete areas are regularly spaced over one side of the backing member.

5 7. A method according to any one of the preceding claims wherein the abrasive particles are selected from natural and synthetic diamond, synthetic Borozon, silicon carbide, zinc oxide, aluminium oxide, cerium oxide, alone or in combination.

10 8. A method according to claim 7 wherein the abrasive particles are in the size range 1 micron to 1 mm.

9. A method according to any one of the preceding claims wherein the resin is an epoxy resin.

15 10. A method according to any one of the preceding claims wherein the resin/abrasive mixture is in liquid, semi-liquid or paste form when applied to the backing member.

20 11. An abrasive member made according to the method of any one of claims 1-10 comprising a flexible woven or perforated backing material to which is directly adhered discrete areas of an intimate mixture of resin/abrasive.

12. A member according to claim 11 wherein the backing material is selected from woven nylon, polyester, and cotton.

25 13. A member according to claim 11 wherein the backing material is perforated sheet material selected from flexible paper, metal, plastics and rubber.

14. A member according to any one of claims 11-13 wherein the discrete areas of resin/abrasive mixture are regularly spaced over one side of the backing material.
  - 5 15. A member according to claim 14 wherein the areas of resin/abrasive are spaced to provide ways for flushing away ground off material.
  - 10 16. A member according to any one of claims 11-15 wherein the backing material is adhered to a rigid base member.
  17. A member according to any one of claims 11-16 wherein the abrasive particles are in the size range of 1 micron to 1 mm.
  - 15 18. An abrasive member according to any one of claims 11-17 substantially as described with reference to the drawings.
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